One Hundred and Two River Basin-10240013

Basin Description

The most upstream portions of the One Hundred and Two River basin lie in southern Iowa. The river flows almost due south to its confluence with the Platte River just north of St. Joseph. The Missouri portion of the basin has an area of 386 square miles. The two largest tributaries are Mozingo and White Cloud creeks. The largest reservoir in the basin is Mozingo Reservoir with a surface area of 1,000 acres.

Average annual rainfall in the basin is 36 inches. Stream flow statistics for the basin are shown in Table 1.

Table 1. Stream Flow Statistics for One Hundred and Two River Basin

Stream/Location	Wtrshed. Area (sq.mi.)	Period Of Record	Flow (cfs)				
			90th Percentile *	Mean	Median **	10th Percentile ***	7Q10 Low Flow+
102 R. @ Maryville	515	1932-90 2004	462	234	29	2.7	0.2
White Cloud Cr. nr. Maryville		1950-72					0.0

*Flow is less than this amount 90 percent of the time
**Flow is less than this amount 50 percent of the time
***Flow is less than this amount 10 percent of the time
+ The lowest average seven consecutive day flow that occurs with a recurrence interval of 10 years.

The One Hundred and Two River basin lies with the Dissected Till Plains physiographic province. The land is a mixture of hills and plains. Fifty-two percent of the land is row crop, 39 percent is pasture and hayfields, 7 percent is forest and 1 percent urban.

Except for limited areas where streams may have incised Pennsylvanian aged rock, the surface of the basin is glacial till overlain by loess. Glacial till is a mostly unsorted mixture of clay, sand, gravel and rock debris created and pushed southward into Missouri by the great glacial ice sheets. Loess is a windblown silt deposit. Depth of the till is highly variable but is generally less than 200 feet. Loess deposits are generally 10-20 feet in depth. Cyclical (repetitive) deposits of sandstone, siltstone, shale, limestone and coal of Pennsylvanian age underlie these glacial deposits. In northwestern Missouri, these bedrock deposits become thicker, often as much as 1,200 feet, due to a surface depression in Pennsylvanian deposits called the Forest City basin.

The presence of the clayey till and the underlying shale and coal beds ensure that there is very little movement of water to the subsurface. Most water movement in the basin is through the surface stream network. Water that reaches the subsurface will resurface locally when a stream valley incises a confining aquatard (an impermeable layer). There are no springs of note in the basin. Since very little water infiltrates to the subsurface, streamflow can be very high during wet weather. For the same reason, base flows, streamflow sustained only by the re-emergence of groundwater into the stream, are very low during the intervening dry periods.

Water Quality Concerns

Acceptable water quality is defined by Missouri's Water Quality Standards [http://www.sos.mo.gov/adrules/csr/current/10csr/10c20-7a.pdf] . Streams or lakes that do not meet these standards are considered "impaired." They may not be fit for certain uses such as swimming, drinking water supply or protection of fish and other aquatic life. Waters are considered to be "affected" rather than "impaired" if water quality changes are less serious and state standards are not exceeded. These standards also list more than 3,600 classified streams and more than 400 classified lakes in the state. A classified stream is one that is either a permanently flowing stream or one that may stop flowing in dry weather but still maintains large pools of water that support aquatic life. Unclassified streams are small tributaries to classified streams. They typically have flowing water only during wet weather and are dry for the remainder of the year.

Water Quality in Prairie Streams
http://www.dnr.mo.gov/env/wpp/watersheds/info/wq-prairie-str.pdf

Aquatic Habitat in Prairie Streams
http://www.dnr.mo.gov/env/wpp/watersheds/info/aquatic-hab-prairie-str.pdf

Point Source Pollution

Point source pollution is a discharge of wastewater from a single location such as a wastewater treatment plant. Wastewater treatment plants can serve industries, small businesses, subdivisions, mobile home parks, apartment complexes, or entire cities. Wastewater from residential sources such as subdivisions, apartments and mobile home parks is often referred to as "domestic wastewater." It contains primarily treated human wastes, food wastes and detergents. The primary pollutants of concern in domestic wastewater are the amount of organic matter, which is commonly reported as Biological Oxygen Demand (BOD), suspended solids and ammonia. Industrial and commercial wastewater can be more complex and may contain, in addition to domestic wastes, heavy metals or man-made organic chemicals that can be potentially toxic. Discharges from most municipal wastewater treatment plants are usually a mixture of domestic and industrial/commercial wastewater. Most wastewater plant discharges are also typically high in nitrogen and phosphorus, two elements that act as fertilizers and can cause excessive algae growth in waters receiving these discharges.

There are 12 permitted domestic or industrial/commercial point sources that discharge a combined 1.69 million gallons per day (mgd) of treated wastewater into the waters of the One Hundred and Two River basin. The largest wastewater discharge in the basin is the 1.9-mgd wastewater discharge from the city of Maryville. There are 110 miles of classified streams in the basin, none of which is affected or impaired by point source discharges. Point source discharges are known to affect or impair 0.1 miles of unclassified streams in the basin.

Wastewater Treatment
http://www.dnr.mo.gov/env/wpp/watersheds/info/wastewater-treatment.pdf

Nonpoint Source Pollution

Nonpoint source pollution occurs when pollutants enter bodies of water at points that are ill-defined and unstable. Examples include the erosion of sediments or the entrance of polluted surface runoff or groundwater into lakes and streams. Locations of nonpoint source pollution are often widely dispersed and are difficult to identify or control. In the One Hundred and Two River basin, the most serious nonpoint problem is degradation of aquatic habitat. A total of 110 miles (100 percent) of classified streams in the basin are considered to have degraded aquatic habitat. The lack of infiltration of rainfall, when combined with local soil tillage and other land uses, leads to a large amount of surface runoff during wet weather. This contributes to soil erosion and high levels of sediment deposition in streams. The quality of aquatic habitat is further impaired by removal of wooded riparian vegetation, and by the channelization, or straightening, of streams. Channelization has occurred in 44 miles (40 percent) of streams in the basin.

Storm water runoff in the Midwest can carry significant amounts of fertilizers, animal wastes, and pesticides into streams. Atrazine is an agricultural herbicide used on corn and grain sorghum that is commonly found in stormwater runoff. Missouri's water quality standards allow no more than 3.0 ug/l atrazine in drinking water reservoirs as a long-term average. Mozingo Lake, the main water supply for Maryville is the only public water supply reservoir in the basin. Pesticide monitoring of this lake began in 2002 and at present there is inadequate data to estimate an average atrazine level in the lake. Drinking water reservoirs throughout northern and western Missouri are also monitored for several other common agricultural herbicides. Results of this monitoring over many years indicates that the only other herbicide that may be a human health concern in drinking water reservoirs is Cyanazine. There is presently inadequate data to estimate average Cyanazine levels in Mozingo Lake. Federal regulations required the end of all Cyanazine use in 2002.

Finished drinking water is monitored regularly at all public supplies in Missouri and has been found to meet state standards for pesticides. Levels of atrazine in finished drinking water supplies may be significantly lower than the amounts found in the reservoirs if the

drinking water plants take measures to reduce Atrazine during the water treatment process.

Groundwater can also be affected by nonpoint source pollution. In northern and western Missouri, some public water supplies and many private water supplies come from groundwater. While public groundwater supplies are routinely tested and protected, many private wells are not. Studies of water quality of private wells in northern and western Missouri show that about one third of wells exceed the drinking water standard for nitrate. About 2 percent exceed drinking water standards for pesticides. This contamination is often caused by local land use practices or surface contamination of the wellhead and does not represent widespread contamination of the underground aquifer. Deeper aquifers are protected from surface contamination by impermeable strata.

During warm weather when stream flows are low, livestock tend to gather in and around streams. The wastes they leave in the water contributes to nuisance algae growths, low levels of dissolved oxygen and elevated levels of ammonia and bacteria.

Water Quality Management

The department achieves water quality management of point source pollutants through the issuance and enforcement of wastewater discharge permits. These permits limit the amount of pollutants that can be discharged. All point source wastewater dischargers must obtain a permit and adhere to its discharge limitations. All permits require at least a level of treatment equal to national wastewater treatment standards. In situations where these national treatment standards are not adequate to protect the streams or lakes receiving these wastewater discharges, stricter permit limits that do protect these waters are required. The permits require regular monitoring and reporting of discharge quality. The department also conducts regular inspection of wastewater treatment facilities and receiving waters.

Nonpoint source pollution is addressed through the state's nonpoint source management plan. This plan is a cooperative program between the Department of Natural Resources and other federal, state and local government agencies or organizations, local landowners and other interested citizens. The plan emphasizes addressing problems at the watershed level through the use of management practices that control nonpoint pollution. The most commonly supported practices are those that control soil erosion on agricultural and urban lands, improve quality and quantity of forage on grazing lands, protect riparian zones, and those that control runoff of animal manures, fertilizers and pesticides. The state nonpoint source management plan is a voluntary program that provides funds to help defray the cost of adopting management practices.

Since 1990, there has been one nonpoint source watershed project in the basin. This project was funded by state sales tax money earmarked for soil and water conservation. The project treated more than 1,700 acres of land, comprising about 1 percent of the entire basin.

Table 3. Nonpoint Source Watershed Projects in the One Hundred and Two River Basin

Watershed Name	County	Project Date	Watershed Size (Acres)	Acres Treated	Percent of Watershed Treated
Long Branch	Andrew	1994-98	6,071	1,756	29%

The Missouri Department of Natural Resources monitors water chemistry and aquatic invertebrate communities at many locations in Missouri. The department also tracks the quality of domestic, industrial and storm water discharges. These monitoring activities provide information on water quality problems, such as their specific location, pollutants, sources and possible solutions. This information guides the management activities the department takes to protect water quality in Missouri.

Web links

Water Quality Data is available via the US Geological Survey National Water Quality Information System
http://waterdata.usgs.gov/mo/nwis/qwdata